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Citation	PUBLICATIONS OF THE SETO MARINE BIOLOGICAL LABORATORY (1970), 17(5): 329-338
Issue Date	1970-02-21
URL	http://hdl.handle.net/2433/175605
Right	
Type	Departmental Bulletin Paper
Textversion	publisher

**STELLICOLA ACANTHASTERIS N. SP. (COPEPODA, CYCLOPOIDA)
ASSOCIATED WITH THE STARFISH ACANTHASTER
PLANCI (L.) AT ENIWETOK ATOLL**

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With 30 Text-figures

The destruction of corals by the feeding of *Acanthaster planci* (LINNAEUS), the "crown-of-thorns" starfish, has become extensive in Guam and other parts of the Pacific Ocean (CHESHER, 1969). An understanding of the biology of such a destructive echinoderm, including its parasites and associates, assumes special importance. Only one copepod, *Onychopygus impavidus* HUMES and CRESSEY, 1958, has hitherto been reported from *A. planci*. From two of these starfishes in Madagascar 350 specimens of this small stellicomitid siphonostome were recovered (HUMES and CRESSEY, 1958). The copepods probably do not seriously interfere with the well-being of the host, though little evidence is available in this regard.

At Eniwetok Atoll the new lichomolgid copepod described below was found on all three *A. planci* examined. *Onychopygus impavidus*, however, did not occur on these hosts.

The figures have been prepared with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn. The abbreviations used are: A_1 =first antenna, A_2 =second antenna, MXPD=maxilliped, and P_1 =leg. 1.

The specimens were collected by the author during field work made possible by the support and facilities of the Eniwetok Marine Biological Laboratory at Eniwetok in the Marshall Islands. The study of the copepods has been aided by a grant (GB-8381X) from the National Science Foundation of the United States.

Stellicola acanthasteris n. sp.

(figs. 1-30)

Type material.—19 ♀♀ and 19 ♂♂ from one *Acanthaster planci* (LINNAEUS), in 3 m, in the lagoon at the northern end of Sand Island, north of Eniwetok Island, Eniwetok Atoll (11°20'N, 162°20'E), 28 June 1969. Holotype ♀, allotype, and 30 paratypes

(15 ♀♀, 15 ♂♂) deposited in the United States National Museum, Washington, and the remaining paratypes (dissected) in the collection of the author.

Other specimens (also from *Acanthaster planci*).—14 ♀♀, 8 ♂♂ and 1 copepodid from 1 host, in 3 m, at the type locality, 8 July 1969; and 16 ♀♀, 10 ♂♂, and 1 copepodid from 1 host, in 13 m, in the lagoon west of the beach between Parry Island and Eniwetok Island, 10 July 1969.

Female.—The body (figs. 1 and 2) has a rather wide and moderately thickened prosome. The length (not including the setae on the caudal rami) is 1.89 mm (1.73–1.95 mm) and the greatest width 0.91 mm (0.85–0.96 mm), based on 10 specimens in lactic acid. The ratio of the length to the width of the prosome is 1.43:1. The segment of leg 1 is distinctly separated from the head by a transverse furrow. The epimeral areas of the segment bearing leg 4 are much smaller than in the preceding segments. The ratio of the length of the prosome to that of the urosome is 2:1.

The segment of leg 5 (fig. 3) is $143 \times 208 \mu$. Between this segment and the genital segment there is a well-formed ventral intersegmental sclerite (fig. 4). The genital segment in dorsal view is $319 \times 226 \mu$ (greatest width), with slight lateral indentations behind the areas of attachment of the egg sacs. These areas are located dorsolaterally near the middle of the segment. Each area (fig. 5) bears two naked setae 40μ and 46μ in length with a spiniform process about 6μ long between them. There are apparently only two functional postgenital segments. The anterior one is $104 \times 150 \mu$. The posterior one is $83 \times 130 \mu$ and has a complete suture, dividing the segment into two parts 36μ and 47μ long in dorsal view respectively. In lateral view the suture runs obliquely (fig. 2). There is no membranous ring between these two parts such as occurs normally between postgenital segments. The posterior margin of the anal segment bears on each side a row of ventrolateral spinules.

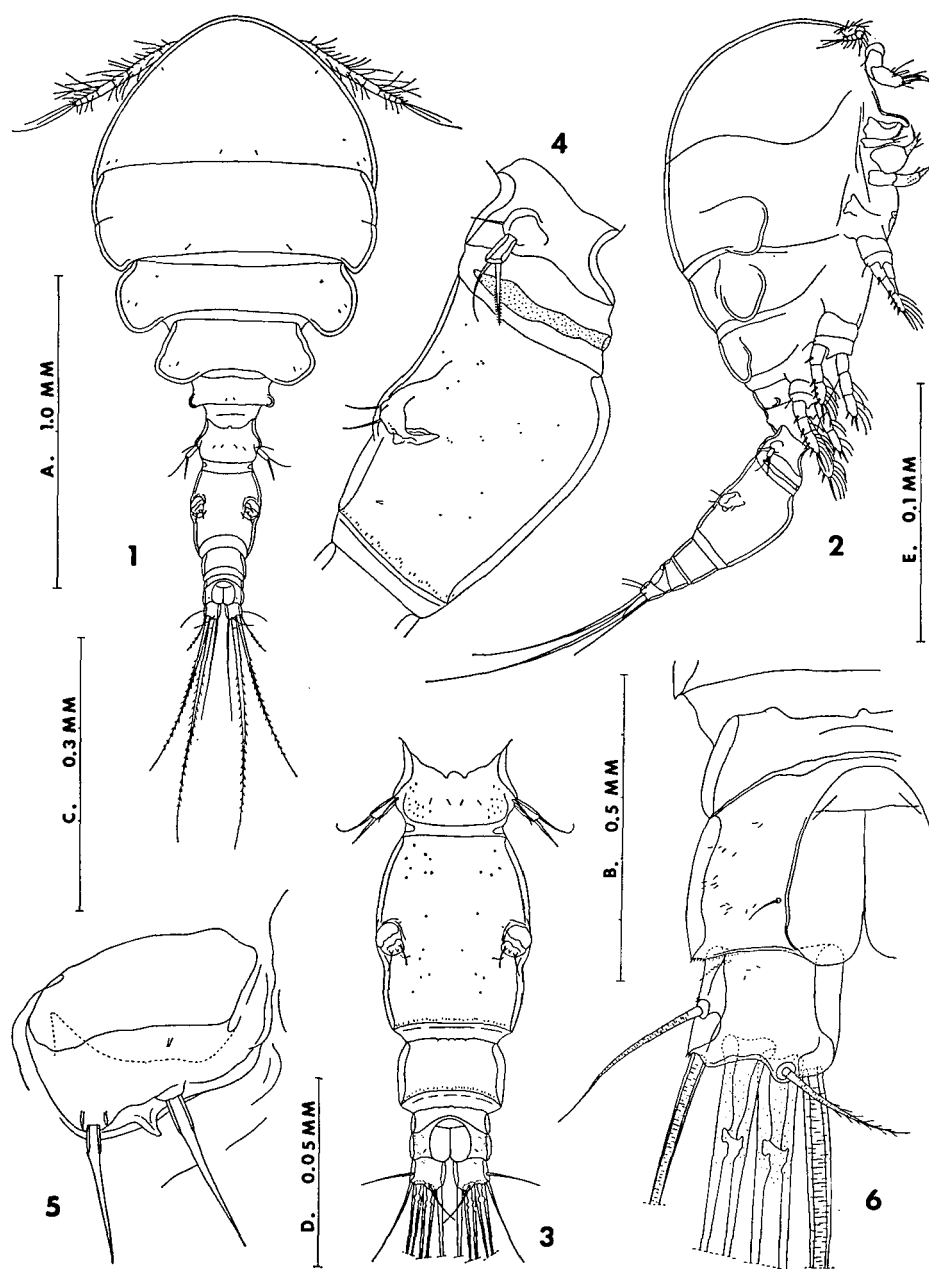
The caudal ramus (fig. 6) is nearly quadrate, $52 \times 56 \mu$ in greatest dimensions. The outer lateral seta is 78μ and naked. The dorsal pedicellate seta is 62μ and delicately feathered. The outermost terminal seta is 170μ , with short lateral hairs in its distal half. The innermost terminal seta is 400μ , also with short lateral hairs distally. The two median terminal setae are 650μ (outer) and 850μ (inner), both with finely punctate bases, both with lateral hairs, and both not annulated as are the other four setae. There is a setule 18μ long on the proximal outer ventral area of the ramus.

The dorsal surface of the prosome and both dorsal and ventral surfaces of the urosome bear a few hairs and more numerous refractile points.

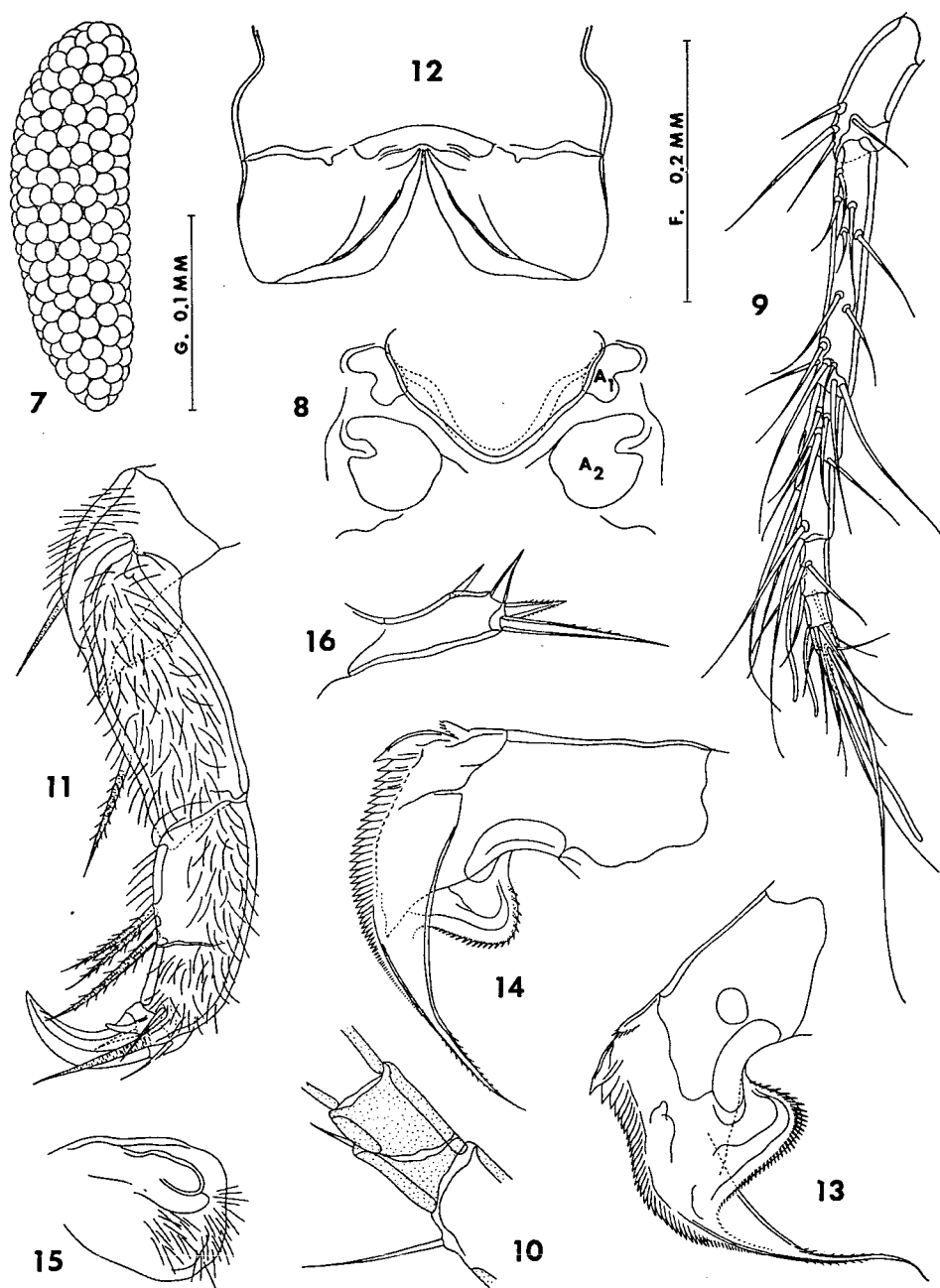
The egg sac (fig. 7) is elongated, about $1185 \times 365 \mu$, extends to the tips of the longest ramal setae, and contains many small eggs each approximately 65μ in diameter.

The rostrum (fig. 8) is subtriangular, with its posteroventral tip rounded.

The first antenna (fig. 9) is about 460μ long and 7-segmented, with the third segment showing ventrally a sclerotization (fig. 10) suggesting an intercalary segment.



Figs. 1-6. *Stellicola acanthasteris* n.sp., female. 1, dorsal (A); 2, lateral (A); 3, urosome, dorsal (B); 4, segment of leg 5 and genital segment, lateral (C); 5, area of attachment of egg sac, dorsolateral (D); 6, caudal ramus and part of anal segment, dorsal (E).



Figs. 7-16. *Stellicola acanthasteris* n.sp., female. 7, egg sac, lateral (A); 8, rostrum, ventral (C); 9, first antenna, dorsal (F); 10, third segment of first antenna, ventral (E); 11, second antenna, anterior (F); 12, labrum, ventral (G); 13, mandible, posterior (E); 14, mandible, anterior (E); 15, paragnath, ventral (D); 16, first maxilla, anterior (E).

The lengths of the segments (measured along their posterior non-setiferous margins) are: 57 (107 μ along its anterior margin), 177, 44, 55, 39, 22, and 20 μ respectively. The formula for the armature is 4, 13, 6, 3, 4+1 aesthete, 2+1 aesthete, and 7+1 aesthete, as usual in *Stellicola*. All the setae are naked.

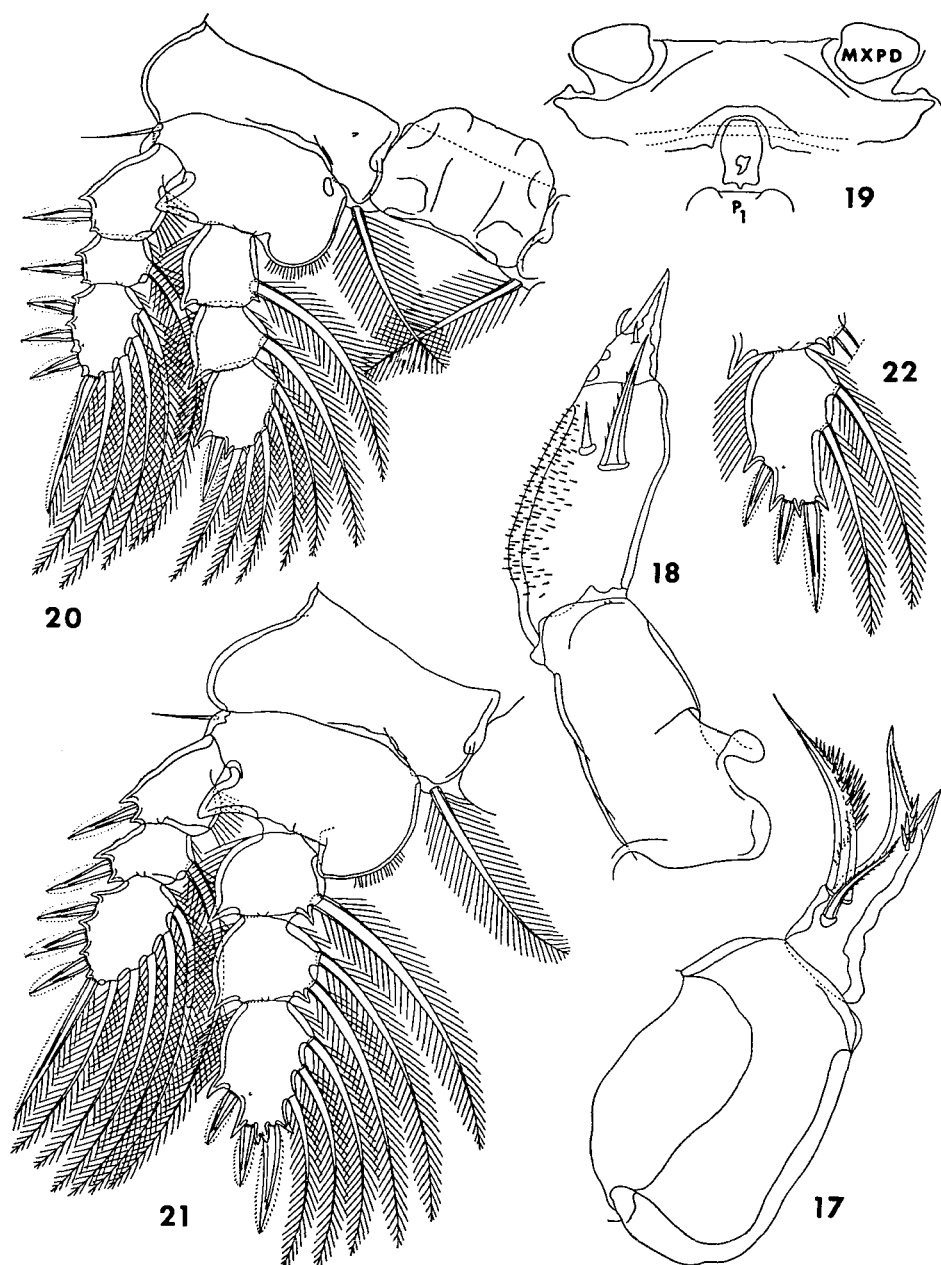
The second antenna (fig. 11) is 430 μ long and 3-segmented, but the third segment is incompletely divided on its anterior surface (the posterior surface being entire). Each of the first two segments bears a single seta. The third segment bears three inner setae located just proximally to the incomplete division and terminally one claw (112 μ along its axis) and five setae. The seta on segment 2 and the three inner setae on segment 3 are hairy. The anterior surface of the three segments is covered with slender hairlike setules; the posterior surface is unornamented.

The labrum (fig. 12) has two divergent and somewhat truncated posteroventral lobes.

The mandible (figs. 13 and 14) bears on its convex margin a small scalelike spinulose process, followed by a long series of toothlike serrations; its concave margin bears a large posterior expansion fringed with spinules (fig. 13), while anteriorly this margin is smooth (fig. 14). The moderately short terminal lash has lateral spinules. The paragnath (fig. 15) is a small lobe partly covered with hairs. The first maxilla (fig. 16) bears four setae, three terminal with one much longer than the other two, and one subterminal. The second maxilla (fig. 17) has an unarmed first segment. The second segment has a surficial posterior barbed seta and a large inner spine bearing prominent spinules. The terminal lash is unusually short, much shorter than the inner spine, and bears proximally one large outer spine and a surficial posterior group of smaller spines, followed by a row of small barbs along the outer edge. The maxilliped (fig. 18) is 3-segmented. The first segment is unarmed. The second segment bears two unequal setae and a group of spinules. The small third segment bears two small hyaline elements and terminates in a spiniform prolongation.

The ventral surface between the maxillipeds and the first pair of legs is not protuberant. A sclerotized line connects the bases of the maxillipeds (fig. 19).

Legs 1-4 (figs. 20, 21, 22, and 23) have 3-segmented rami, except for the endopod of leg 4 which is 2-segmented. The spine and setal formula is the same as that given for *S. kossmanni* HUMES and HO, 1967, and *S. pichoni* HUMES and HO, 1966. The inner seta on the coxa of legs 1-3 is long and plumose, but in leg 4 this seta is shorter (61 μ) and naked. The inner margin of the basis in legs 1-3 bears a row of hairs, but in leg 4 this margin is smooth. The endopod of leg 4 (175 μ long) is a little shorter than the exopod (240 μ), the ratio being 1:1.37. The first segment of this endopod is 55 \times 41 μ , with its inner seta 88 μ and its outer margin smooth. The second segment is 120 μ long (including the terminal spinous process) and 38 μ wide at the level of the inner seta; there is no trace of a line of division of this segment. The inner seta is 88 μ and the two terminal spines are 72 μ (outer) and 116 μ (inner). The outer edge of the segment bears hairs and there is a row of minute spinules near the



Figs. 17–22. *Stellicola acanthasteris* n.sp., female. 17, second maxilla, posterior (E); 18, maxilliped, anterior (E); 19, area between maxillipeds and first pair of legs, ventral (C); 20, leg 1 and intercoxal plate, anterior (F); 21, leg 2, anterior (F); 22, third segment of endopod of leg 3, anterior (F).

insertions of the terminal spines. One abnormal endopod (fig. 24) had an extra seta on the second segment, the endopod on the opposite leg 4 being normal.

Leg 5 (fig. 25) has a subrectangular unornamented free segment $45 \times 17.5 \mu$. The terminal armature consists of a spine 78μ with a narrow spinulose fringe and a naked seta 72μ . The seta on the body near the free segment is 39μ and feathered.

Leg 6 is probably represented by the two setae near the attachment of each egg sac (fig. 5).

The color in life in transmitted light is reddish, the prosome bright rosy red, the urosome pale red, the eye red, the egg sacs wine-colored.

Male.—The body form (fig. 26) resembles in general outline that of the female. The length (without the ramal setae) is 1.59 mm (1.54–1.62 mm) and the greatest width 0.64 mm (0.61–0.66 mm), based on 10 specimens in lactic acid. The ratio of the length to the width of the prosome is 1.56:1. The ratio of the length of the prosome to that of the urosome is 1.46:1.

The segment of leg 5 (fig. 27) is $104 \times 169 \mu$. The ventral sclerite between this segment and the genital segment is very reduced and incompletely formed. The genital segment in dorsal view is $340 \times 330 \mu$ with rounded lateral margins. There are three functional postgenital segments, $104 \times 148 \mu$, $78 \times 120 \mu$, and $57 \times 104 \mu$ from anterior to posterior, the last one having a suture which, as in the female, divides the segment into two parts 23μ and 34μ long in dorsal view respectively.

The caudal ramus resembles that of the female, though smaller, $39 \times 44 \mu$.

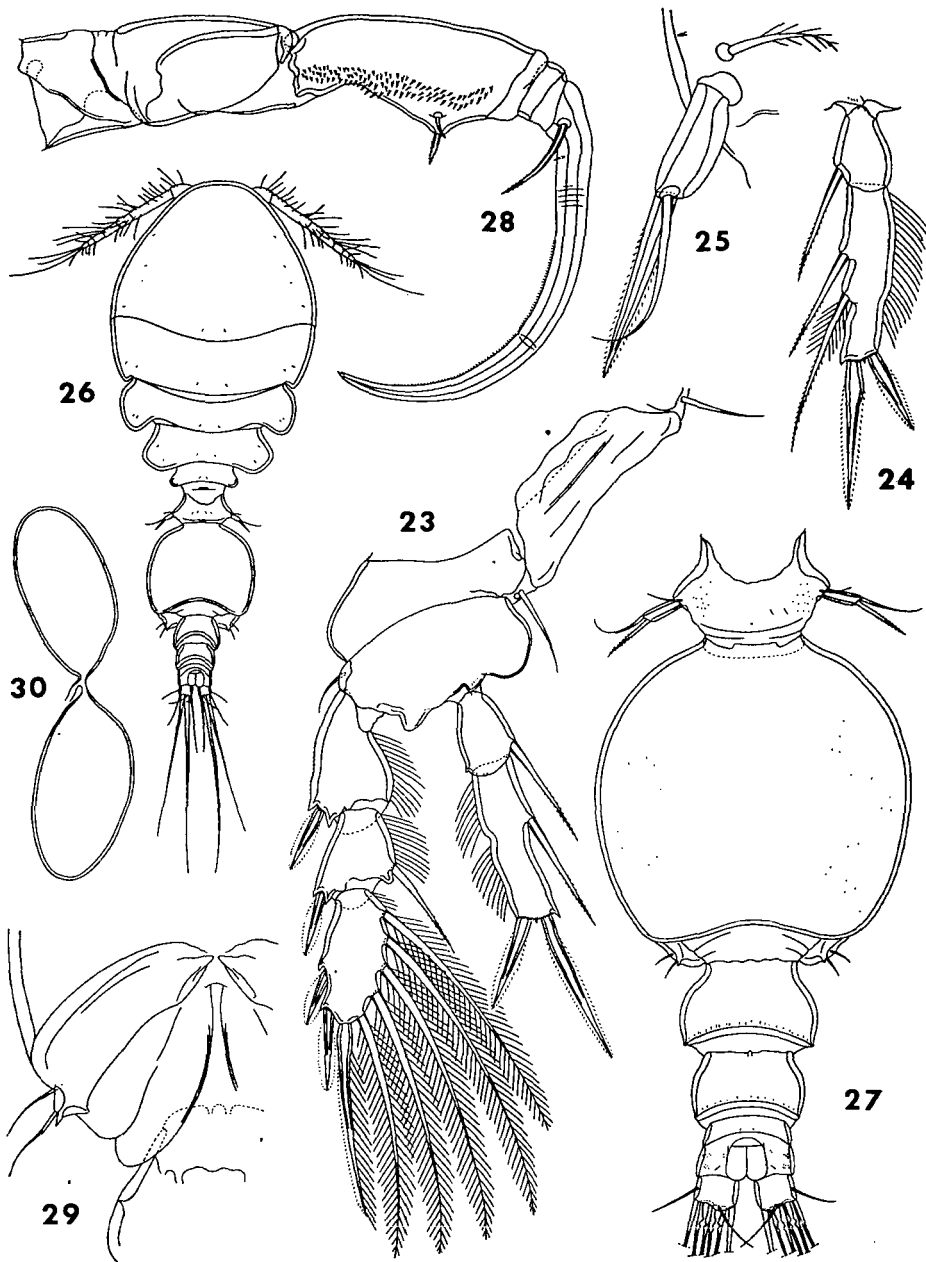
The rostrum, first antenna (with no aesthetes added), second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla are similar to those in the female. The maxilliped (fig. 28) is slender, 400μ long not including the claw, and 4-segmented, assuming that the proximal part of the claw represents a fourth segment. The first and third segments are unarmed. The second segment bears two setae, one finely barbed, the other naked with a blunt hyaline tip, and has an elongated patch of spinules. The recurved claw, 280μ along its axis, bears proximally two very unequal setae and a few transverse striae, and is weakly divided distally. The fringe on the concave margin of the claw consists of slender hyaline spinules almost rectangular in form with truncated tips.

The ventral area between the maxillipeds and leg 1 resembles that in the female.

Legs 1–4 are similar to those in the female, with the same segmentation and armature. The only suggestion of sexual dimorphism occurs in the third segment of the endopod of leg 1, where the spine is a little longer in relation to the segment than in the female (in the male the segment is 66μ long and the spine 53μ ; in the female the segment is 79μ and the spine 52μ).

Leg 5 is like that of the female, the dimensions of the free segment being $41 \times 13.5 \mu$.

Leg 6 (fig. 29) consists of the usual posteroventral flap on the genital segment, bearing two naked setae 20μ and 22μ .



Figs. 23–25. *Stellicola acanthasteris* n.sp., female. 23, leg 4 and intercoxal plate, anterior (F); 24, abnormal endopod of leg 4, anterior (F); 25, leg 5, dorsolateral (E).

Figs. 26–30. *Stellicola acanthasteris* n.sp., male. 26, dorsal (A); 27, urosome, dorsal (C); 28, maxilliped, anterior (F); 29, leg 6, ventral (F); 30 spermatophores, lateral (B).

The spermatophores (fig. 30), attached to the female in pairs, are about $275 \times 137 \mu$, not including the neck.

The color in life in transmitted light is less red than in the female, but still rosy.

Etymology.—The specific name *acanthasteris* is the genitive form of the generic name of the host.

Comparison with related species.—Five species of *Stellicola* have a reduced number of postgenital segments (2 in the female and 3 in the male, instead of 3 and 4 respectively) as in the new species. These are *S. gracilis* (THOMPSON and A. SCOTT, 1903), *S. lankensis* (THOMPSON and A. SCOTT, 1903), *S. pichoni* HUMES and HO, 1966, *S. affinis* HUMES and HO, 1967, and *S. longiseta* HUMES and HO, 1967. (The male of *S. lankensis* is unknown, but the female shows only two postgenital segments.) In none of these does the last postgenital segment have a transverse suture as does *S. acanthasteris*.

Three of these species have a caudal ramus distinctly longer than wide (*S. gracilis*, *S. lankensis*, and *S. affinis*). The remaining two species, *S. longiseta* and *S. pichoni*, have an approximately quadrate caudal ramus, as in the new species. They may be readily distinguished, however, from *S. acanthasteris*. *S. longiseta* has on leg 5 of the female a very long seta, about four times the length of the free segment, and an unusually long seta on the first segment of the second antenna. *S. pichoni* differs in having on leg 5 of the female a relatively long seta, about twice the length of the free segment, and in having a ventral row of spinules terminally on the caudal ramus. Furthermore, in both of these species the areas of attachment of the egg sacs are located distinctly behind the middle of the genital segment, instead of near the middle of this segment as in *S. acanthasteris*.

The new species is larger than any known *Stellicola*. The species nearest in size is *S. lautus* (HUMES and CRESSEY, 1958), where the female is 1.58 mm and the male 1.38 mm in length.

The description of *S. acanthasteris* increases to 22 the number of species in the genus, 16 of which occur on asteroids. (In addition to the new species, the recently described *S. dentifer* HUMES, 1969, should be added to those species listed in HUMES and HO, 1967.)

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